

A Multi-band Photonic Phased Array Antenna for High-Data Rate Communication, Phase I

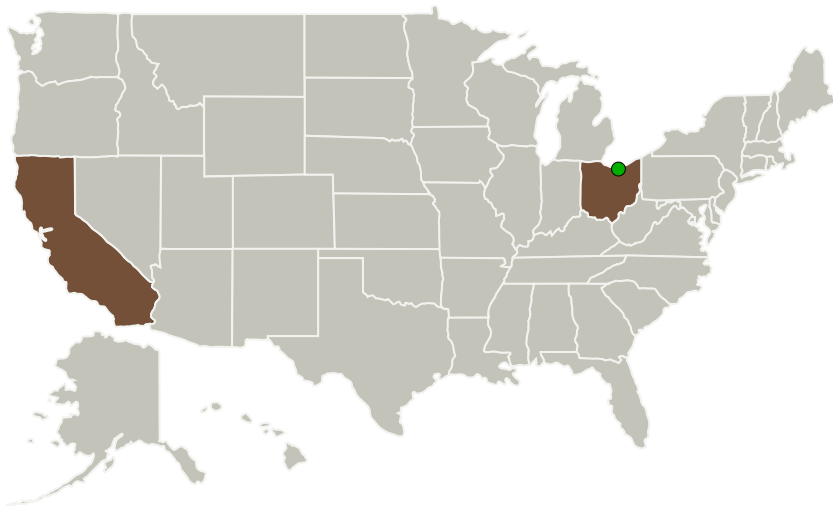
Completed Technology Project (2010 - 2010)



Project Introduction

Multi-band phased array antenna (PAA) can reduce the number of antennas on shipboard platforms while offering significantly improved performance. In order to steer wideband beams, photonic beamforming techniques must be invoked so that efficient elemental vector summation in the receiving mode or in the transmit mode is independent of frequency. Crystal Research, Inc. proposes to develop a multi-band photonic antenna based on a high-speed optical true-time-delay beamformer, capable of simultaneously steering multiple independent RF beams in less than 300 ns. Such a high steering speed is 3 orders of magnitude faster than any other existing optical beamformers. Unlike other approaches, the proposed technology uses a single controlling device per operation band, which eliminates the need for massive optical switches, laser diodes and fiber Bragg gratings. More importantly, only one beamformer is needed for all antenna elements. Advantages of the proposed multi-band photonic phased array antenna includes wideband multibeam operation, high-speed steering, microwave delay compatible, small size, light weight, low power consumption, and immune to electro-magnetic interfere. We plan to develop a laboratory breadboard demonstration the proof-of-concept at the end of Phase I. In Phase II, we will design and fabricate a prototype that can be demonstrated in a representative environment.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Crystal Research, Inc.	Lead Organization	Industry	Fremont, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140555>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Crystal Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

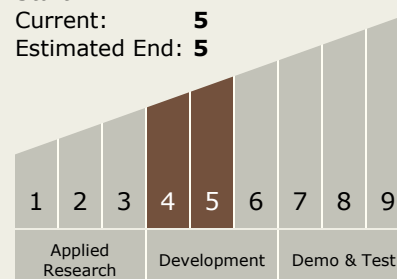
Carlos Torrez

Principal Investigator:

Suning Tang

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.2 Radio Frequency
 - └ TX05.2.6 Innovative Antennas

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System